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| EXAMINER |
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NGUYEN, THANH T

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| ART UNIT | PAPER NUMBER |
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2813

DATE MAILED: 10/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/681,926

Applicant(s)

CHOPRA, DINESH

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 36-46 and 75-95 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 36-46 and 75-95 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/9/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 10/9/03 has been considered.

Oath/Declaration

Oath/Declaration filed on 10/9/03 has been considered.

Drawings

Figures 1A-1B should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 36-46, 77-85 are rejected under 35 U.S.C. 102(b) as being anticipated by Andricacos et al. (U.S. Patent No. 6,268,291).

Referring to figures 1-6, Andricacos et al. teaches a method comprising:

Providing a semiconducting substrate having a first layer of insulating layer (70) formed thereabove, the first layer of insulating material having at least one conductive metal structure (90) positioned therein;

Performing an ion implant process to selectively implant ions only into the at least one conductive metal structure (see figure 4a, col. 10, lines 14-39).

Regarding to claims 37, 78, forming second layer of insulating material above the first layer of insulating material and the at least one conductive metal structure (see figure 1).

Regarding to claims 38, 79 the first layer of insulating material is comprised of at least one of silicon dioxide and BPSG (see col. 9, lines 50-55).

Regarding to claim 39, at least one conductive metal structure is comprised of copper (see col. 10, lines 14-15).

Regarding to claims 40, 77, performing the ion implant process comprises performing the ion implant process using at least one of nitrogen, carbon, silicon and hydrogen (col. 7, lines 1-5, col. 12, lines 60-65).

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Regarding to claims 80, 41, performing the implant process comprises performing the ion implant process at a dopant dose that ranges from approximately $1e^{13}$ - $1e^{21}$ ions/cm² (see tables 2-3).

Regarding to claims 81, 42, performing the ion implant process comprises performing the ion implant process at an energy level ranging from approximately 1-200 keV (see tables 2-3).

Regarding to claims 82, 43, performing an ion implant process to selectively implant ions only into at least the at least one conductive metal structure comprises performing an ion implant process to selective implant ions only into at least the at least one conductive metal structure to thereby form a doped region in at least the conductive metal structure (see figure 4a/5a, col. 10, lines 13-16, col. 7, lines 1-10).

Regarding claims 83, 44, the doped region has a thickness that ranges from approximately 5-50nm (see col. 7, lines 1-10).

Regarding to claims 84, 45, the doped region has a dopant concentration level that ranges from approximately $1e^{15}$ - $1e^{21}$ ions/cm³ (see tables 2-3).

Regarding to claims 85 46, forming a second conductive metal (copper) structure above the doped region in the at least one conductive metal (copper) structure (see figure 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made

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to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 75-76, 86-87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al. (U.S. Patent No. 6,268,291) as applied to claims 36-46, 77-85 in view of Campi et al. (U.S. Patent Publication No. 2003/0022072).

Andricacos et al. teaches a method of implant ions into at least one conductive metal (copper) structure. However, the references does not teach implanting ions through a reticle positioned above the conductive copper.

Campi teaches implant ions through a reticle that is positioned above the conductive metal structure (photomask is a reticle, see paragraph# 45).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form reticle in process of Andricacos et al. as taught by Campi because using the reticle (photomask) for implantation mask to cover the unwanted area.

Claims 88-95 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (U.S. Patent No. 6,500,749 in view of Campi et al. (U.S. Patent Publication No. 2003/0022072) and Andricacos et al. (U.S. Patent No. 6,268,291).

Referring to figures 1-3, Liu teaches a method of providing a semiconducting substrate having a first layer of insulating material (12) formed thereabove said first layer of insulating material having at least one conductive copper structure (26) positioned therein; and

performing an ion implant process to implant ions only into said at least one conductive

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copper structure, said implanted ions comprised of at least one of hydrogen, carbon, silicon and nitrogen, wherein said step of implant ions is performed by implanting ions at a dopant dose that ranges from approximately $1e^{13}$ - $1e^{21}$ ions/cm² (see figure 2, col. 2, lines 61-67, col. 3, lines 1-4) through a reticle (32, called mask) that is positioned above and not in contact with said conductive copper structure.

Regarding to claim 89. The method of claim 88, further comprising forming a second layer of insulating material above said first layer of insulating material and said at least one conductive copper structure (38, see figure 3).

Regarding to claim 90. the method of claim 88, wherein said first layer of insulating material is comprised pf, at least one of silicon dioxide and BPSG (col. 2, lines 22-23).

Regarding to claim 92. The method of claim 88, wherein performing an ion implant process to implant ions into at least said at least one conductive copper structure comprises performing an ion implant process to implant ions into at least said at least one conductive copper structure to thereby form a doped region in at least said conductive metal structure, said doped region being comprised of at least one of said implant ions (see figure 2, col. 2, lines 61-67, col. 3, lines 1-4).

Regarding to claim 95, forming a second conductive copper structure above the doped region in the at least on conductive copper structure (see col. 3, lines 24-26). It would be obvious to one ordinary skill in the art to form a plurality of the conductive copper structure above the doped region since it is well-known in the art to repeat the same process for multiple effect. See St. Regis paper, Co. V. Bemis Co. Inc. 193 USPQ 8, 11 (7th circuit 1977).

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However Liu does not teach photomask is a reticle, the thickness of the doped region, the dopant concentration level, and the energy level.

Campi teaches implant ions through a reticle that is positioned above the conductive metal structure (photomask is a reticle, see paragraph# 45).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form reticle in process of Liu as taught by Campi because using the reticle (photomask) for implantation mask to cover the unwanted area.

Andricacos et al. teaches the thickness of the doped region (see col. 7, lines 1-10), the dopant concentration level (see tables 2-3), and the energy level (see tables 2-3).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would provide the parameter in process of Liu et al. as taught by Andricacos et al. because the process is known in the art to control the dopant profile.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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Claims 36-36, 75-95 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-26 of U.S. Patent No. 6,703,309.

Although the conflicting claims are not identical, they are not patentably distinct from each other because both the present invention and the patent teach a method of a semiconductor substrate having a first layer of insulating material formed thereabove, the first layer of insulating material having at least one conductive metal structure positioned therein, and performing an ion implant process to selectively implant ions only into the at least one conductive structure.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).



Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN